

BULLETIN OF MISCELLANEOUS INFORMATION No. 5 1929 ROYAL BOTANIC GARDENS, KEW

XXVII.—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS**: III. E. M. MARSDEN-JONES AND W. B. TURRILL.

INDIVIDUALS, CHARACTERS, AND POPULATIONS OF *S. MARITIMA* OCCURRING IN NATURE.

In the first paper of this series (*K.B.* 1928, p. 1) we dealt with the results of controlled hybridization of *S. maritima* and *S. vulgaris*. In the second paper* we described naturally occurring hybrids between the same species. In the present account we deal only with *S. maritima* as we have studied it in wild material. We first describe a number of stock-plants which have been collected from various localities and have been used for breeding work which is not yet completed. Throughout this work we mean by 'stock-plant' an individual plant collected in the wild and transplanted to one of our breeding grounds for use in controlled crossing, selfing, or biological experiments. Seedlings from natural seed of some of the stock-plants are then described. The plant organs of *S. maritima* are considered *seriatim* and the character variations we have found are dealt with in some detail. A simple scheme to replace intra-specific nomenclature and reduce the length of descriptions is tentatively proposed. Finally, certain wild populations of *S. maritima* are described.

Stock-Plants of *S. maritima*.

Descriptions of stock-plants A.1 and A.2 were given in our first paper of this series (*K.B.* 1928, 1).

A.3. Chesil Beach, Dorset, Portland end, 1926.

Habit spreading, stems half-prostrate, up to 3 dm. long; with barren stems; much anthocyanin throughout plant.

Leaves very uniform on the whole though varying in length according to position, linear or narrowly lanceolate- or oblanceolate-linear, acute, slightly apiculate, slightly narrowed to the base, uppermost pair slightly amplexicaul, 2.5 cm. long, ‡ 4 mm. broad, very few widely scattered short cilia, somewhat fleshy, dark glaucous green suffused with anthocyanin.

Inflorescence of 1 to 3 flowers, erect when in bloom. Bracts glabrous, not ciliated, lower green, herbaceous, similar to uppermost

*Continued from *Kew Bull.* 1929, p. 38.

‡Leaf measurements are always taken from average well-developed leaves of nodes about the middle of the stems.

leaves, ovate, acute, upper smaller and narrower and becoming completely scarious.

Calyx broadly ellipsoid in flower, becoming broadly obovoid in fruit.

Corolla with the petals and segments both contiguous ; diameter 2.7 cm. Petals 2.5 cm. long, 1.4 cm. broad, lamina lobed for $\frac{3}{4}$ its length, scales well developed, anthocyanin blotch showing both above and below.

Androecium fully functional, flowers hermaphrodite.

Gynaeceum with white stigmata and pink immature seeds.

Ripe capsules broadly ovoid, slightly narrowed in the upper part, without the teeth 7 mm. long, 8 mm. broad, mouth 4 mm. in diameter ; teeth each an isosceles triangle, 4 mm. long, 2 mm. broad at the base, strongly recurved ; carpophore 4 mm. long, 2.5 mm. broad.

Mature seeds weak armadillo.

A.4. Chesil Beach, Dorset, Portland end, 1926.

Habit spreading, stems prostrate, up to 2.75 dm. long ; with barren stems ; very much anthocyanin throughout plant.

Leaves linear or narrowly lanceolate- or oblanceolate-linear, acute, slightly apiculate, slightly narrowed to the base, uppermost pair slightly amplexicaul, 2.5 cm. long, 4-4.5 mm. broad, short well-spaced cilia on the margins, somewhat fleshy, dark glaucous green suffused with much anthocyanin.

Inflorescence as in A.3.

Calyx broadly ellipsoid in flower, becoming broadly obovoid in fruit.

Corolla with the petals and segments both divergent ; diameter 2.9 cm. Petals 2.6 cm. long, 1.3 cm. broad, lamina lobed for $\frac{3}{4}$ its length, scales well developed, a small anthocyanin blotch showing below and faintly above.

Androecium fully functional, flowers hermaphrodite.

Gynaeceum with white stigmata and pink immature seeds.

Ripe capsules broadly ovoid, slightly contracted above, without the teeth 6 mm. long, 8 mm. broad, mouth 3.5 mm. in diameter ; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly recurved ; carpophore 4 mm. long, 3 mm. broad.

Mature seeds armadillo.

A.5. Chesil Beach, Dorset, Portland end, 1926.

Habit spreading, stems prostrate, up to 3 dm. long ; with barren stems ; very much anthocyanin throughout the plant particularly in the calyx.

Leaves linear or narrowly lanceolate- or oblanceolate-linear, acute, slightly apiculate, slightly narrowed to the base, uppermost pair slightly amplexicaul, 3 cm. long, up to 4.5 mm. broad, no cilia, absolutely glabrous, somewhat fleshy, dark glaucous green suffused with much anthocyanin.

Inflorescence as in A.3.

Calyx narrow-cylindric in flower and fruit.

Corolla with the petals divergent but the segments contiguous ; diameter 2.7 cm. Petals 2.5 cm. long, 1.1 cm. broad, lamina lobed for $\frac{3}{4}$ its length, scales well developed, anthocyanin blotch showing above and below.

Androecium fully functional, flowers hermaphrodite.

Gynaecium with purplish stigmata and pink immature seeds.

Ripe capsules broadly ovoid, slightly contracted above, without the teeth 7 mm. long, 7 mm. broad, mouth 3 mm. in diameter ; teeth each an isosceles triangle, 3.5 mm. long, 2 mm. broad at the base, strongly recurved ; carpophore 3 mm. long, 3 mm. broad.

Mature seeds armadillo.

A.6. Chesil Beach, Dorset, Portland end, 1926.

Habit spreading, half-prostrate, up to 4 dm. long ; with barren stems ; very much anthocyanin throughout the plant particularly in the calyx.

Leaves linear or narrowly lanceolate- or oblanceolate-linear, acute, slightly apiculate, slightly narrowed to the base, uppermost pair slightly amplexicaul, 2.8 cm. long, 3-4 mm. broad, short well spaced cilia on the margins, somewhat fleshy, dark glaucous green suffused with much anthocyanin.

Inflorescence as in A.3 but 2 or 3 cilia near the apex of each bract.

Calyx narrow-cylindric in flower, obovoid-cylindric in fruit.

Corolla with the petals and segments both overlapping ; diameter 2.6 cm. Petals 2.8 cm. long, 1.5 cm. broad, lamina lobed for $\frac{3}{4}$ its length, scales well developed, anthocyanin blotch showing above and below.

Androecium fully functional, flowers hermaphrodite.

Gynaecium with white stigmata and pink immature seeds.

Ripe capsules broadly ovoid, slightly contracted above, without the teeth 7 mm. long, 7 mm. broad, mouth 3.5 mm. in diameter ; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly recurved ; carpophore 4 mm. long, 2 mm. broad.

Mature seeds armadillo.

A.7. Chesil Beach, Dorset, nearly opposite Wyke Regis, 1926.

Habit compact, stems prostrate, up to 3 dm. long ; with barren stems ; whole plant absolutely devoid of anthocyanin.

Leaves oblanceolate or narrowly oblong-elliptic to narrowly ovate or obovate (*i.e.* in shape similar to those of A.1 but shorter and narrower), apex acute to obtuse, slightly apiculate, often conspicuously narrowed to the base especially in the lower ones, uppermost pair slightly amplexicaul, 1.6 cm. long, 4-5 mm. broad, margins distinctly ciliate, glaucous green.

Inflorescence as in A.3, bracts with few or no cilia.

Calyx ellipsoid in flower, broadly obovoid in fruit.

Corolla with the petals and segments both contiguous or even overlapping ; diameter 3.2 cm. Petals 2.7 cm. long, 1.8 cm. broad, lamina lobed for $\frac{3}{4}$ its length, scales well developed, no anthocyanin blotch above or below.

Androecium fully functional, flowers hermaphrodite.

Gynaeceum with white stigmata and white immature seeds.

Ripe capsules obloid*, without the teeth 6.5 mm. long, 9 mm. broad, mouth 5.5 mm. in diameter ; teeth each an isosceles triangle, 4 mm. long, 2.5 mm. broad at the base, strongly recurved ; carpophore 3 mm. long, 2.5 mm. broad.

Mature seeds armadillo.

A.8. Chesil Beach, Dorset, Portland end, 1926.

Habit spreading, stems decidedly prostrate, up to 4 dm. long ; with barren stems ; much anthocyanin throughout plant.

Leaves linear or narrowly lanceolate- or oblanceolate-linear, acute, slightly apiculate, slightly narrowed to the base, uppermost pair slightly amplexicaul, 2.4 cm. long, 4 mm. broad, with few scattered very short cilia, somewhat fleshy, dark glaucous green.

Inflorescence as in A.3.

Calyx broadly ellipsoid in flower becoming broadly obovoid in fruit.

Corolla with the petals and segments both overlapping ; diameter 3 cm. Petals 2.7 cm. long, 1.3 cm. broad, lamina lobed for $\frac{3}{4}$ its length, scales well developed, no anthocyanin blotch above or below.

Androecium fully functional, flowers hermaphrodite.

Gynaeceum with purplish stigmata and pink immature seeds.

Ripe capsules broadly ovoid to obloid, without the teeth 6 mm. long, 8 mm. broad, mouth 4 mm. in diameter ; teeth each an isosceles triangle, 3.5 mm. long, 2.5 mm. broad at the base, strongly recurved, carpophore 4.5 mm. long, 3 mm. broad.

Mature seeds armadillo.

A.9. Chesil Beach, Dorset, Portland end, 1926.

Habit spreading, stems decidedly prostrate, up to 4 dm. long ; with barren stems ; much anthocyanin in all parts of the plant.

Leaves linear or narrowly lanceolate- or oblanceolate-linear, acute, slightly apiculate, slightly narrowed to the base, uppermost pair slightly amplexicaul, 2.3 cm. long, 4 mm. broad, margins glabrous or with only 1 to 3 cilia on each side, somewhat fleshy, dark glaucous green suffused with much anthocyanin.

Inflorescence as in A.3, bracts without cilia.

Calyx narrow-cylindric in flower, ovoid-cylindric in fruit.

Corolla with the petals and segments contiguous ; diameter 3 cm. Petals 2.5 cm. long, 1.3 cm. broad, lamina lobed for $\frac{3}{4}$ its length, scales small, anthocyanin blotch showing above and below.

Androecium fully functional, flowers hermaphrodite.

Gynaeceum with white stigmata and pink immature seeds.

*See page 160 under FRUITS.

Ripe capsules broadly ovoid, slightly contracted above, without the teeth 7 mm. long, 8 mm. broad, mouth 4 mm. in diameter; teeth each an isosceles triangle, 3.5 mm. long, 2 mm. broad at the base, strongly recurved; carpophore 3.5 mm. long, 2.5 mm. broad.

Mature seeds tubercled.

A.10. Chesil Beach, Dorset, nearly opposite Wyke Regis, 1926.

Habit semi-prostrate, stems up to 3 dm. long; a small amount of anthocyanin except in the leaves.

Leaves oblanceolate or narrowly oblong-elliptic to narrowly ovate or obovate, apex obtuse to acute, slightly apiculate, often conspicuously narrowed to the base especially in the lower ones, uppermost pair slightly amplexicaul, 1.3 cm. long, 4 mm. broad, margins distinctly ciliate, somewhat fleshy, dark glaucous green.

Inflorescence as in A.3.

Calyx broadly ellipsoid in flower but somewhat more suddenly contracted upwards and gradually below than is usual, broadly obovoid in fruit.

Corolla with the petals contiguous or overlapping and the segments divergent; diameter 2.8 cm. Petals 2.4 cm. long, 1.9 cm. broad, lamina lobed for $\frac{3}{4}$ its length, scales well developed, no anthocyanin blotch above or below.

Androecium fully functional, flowers hermaphrodite.

Gynaecium with white stigmata and pink immature seeds.

Ripe capsules broadly ovoid, without the teeth 7 mm. long, 7 mm. broad, mouth 4 mm. in diameter; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly recurved; carpophore 3.5 mm. long, 2 mm. broad.

Mature seeds armadillo.

A.11. Chesil Beach, nearly opposite Wyke Regis, 1926.

Habit semi-prostrate, stems up to 3.6 dm. long; a small amount of anthocyanin except in the leaves.

Leaves narrow-lanceolate to linear-lanceolate, acute, 2.2 cm. long, 5 mm. broad, margins distinctly ciliate, somewhat fleshy, dark glaucous green.

Inflorescence as in A.3, bracts with few cilia.

Calyx broadly ellipsoid in flower but a little narrowed to the base, broadly obovoid in fruit.

Corolla with the petals and segments contiguous; diameter 3 cm. Petals 2.5 cm. long, 1.4 cm. broad, lamina lobed for $\frac{3}{4}$ its length, scales very well developed, no anthocyanin blotch above or below.

Androecium fully functional and flowers hermaphrodite except in one flower which was female.

Gynaecium with white stigmata and pink immature seeds.

Ripe capsules broadly ovoid, without the teeth 8 mm. long, 8 mm. broad, mouth 4.5 mm. in diameter; teeth each an isosceles

triangle, 3 mm. long, 2.5 mm. broad at the base, strongly recurved ; carpophore 3.5 mm. long, 2.5 mm. broad.

Mature seeds armadillo.

A.12. Chesil Beach, nearly opposite Wyke Regis, 1926.

Habit semi-prostrate, stems up to 3.6 dm. long ; whole plant free from anthocyanin.

Leaves oblanceolate or narrowly oblong-elliptic to narrowly ovate or obovate (*i.e.* in shape similar to those of A.1 and A.7), apex acute to obtuse, slightly apiculate, often conspicuously narrowed to the base especially in the lower ones, uppermost pair slightly amplexicaul, 2.3 cm. long, 4 mm. broad, margins distinctly ciliate, somewhat fleshy, green glaucous.

Inflorescence as in A.3, bracts with few or no cilia.

Calyx ellipsoid in flower, broadly obovoid in fruit.

Corolla with the petals and segments both contiguous or even overlapping ; diameter 3 cm. Petals 2.8 cm. long, 1.5 cm. broad, lamina lobed for $\frac{3}{4}$ its length, scales well developed, no anthocyanin blotch above or below.

Androecium fully functional, flowers hermaphrodite.

Gynaeceum with white stigmata and white immature seeds.

Ripe capsules broadly ovoid, without the teeth 8 mm. long, 8 mm. broad, mouth 4 mm. in diameter ; teeth each an isosceles triangle, 3 mm. long, 2.5 mm. broad at the base, strongly reflexed ; carpophore 4 mm. long, 3 mm. broad.

Mature seeds armadillo.

A.13. Chesil Beach, Dorset, eastern portion, near the roadside, 1926.

Habit prostrate, stems up to 2.5 dm. long ; a small amount of anthocyanin in the calyx only.

Leaves lanceolate- or oblanceolate-linear, acute, 1.8 cm. long, 4 mm. broad, margins distinctly ciliate, green glaucous.

Inflorescence as in A.3.

Calyx ellipsoid in flower, broadly obovoid in fruit.

Corolla petals and segments widely divergent ; diameter 1.9 cm. Petals 2 cm. long, 6 mm. broad, lamina lobed for $\frac{3}{4}$ its length, scales poorly developed (as in F₁ plants), no anthocyanin blotch above or below.

Androecium fully functional, flowers hermaphrodite.

Gynaeceum with white stigmata and pink immature seeds.

Ripe capsules obloid, without the teeth 6 mm. long, 7.5 mm. broad, mouth 4 mm. in diameter ; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly recurved ; carpophore 3.5 mm. long, 2 mm. broad.

Mature seeds armadillo.

A.14. Chesil Beach, Dorset, eastern portion, near the roadside, 1926.

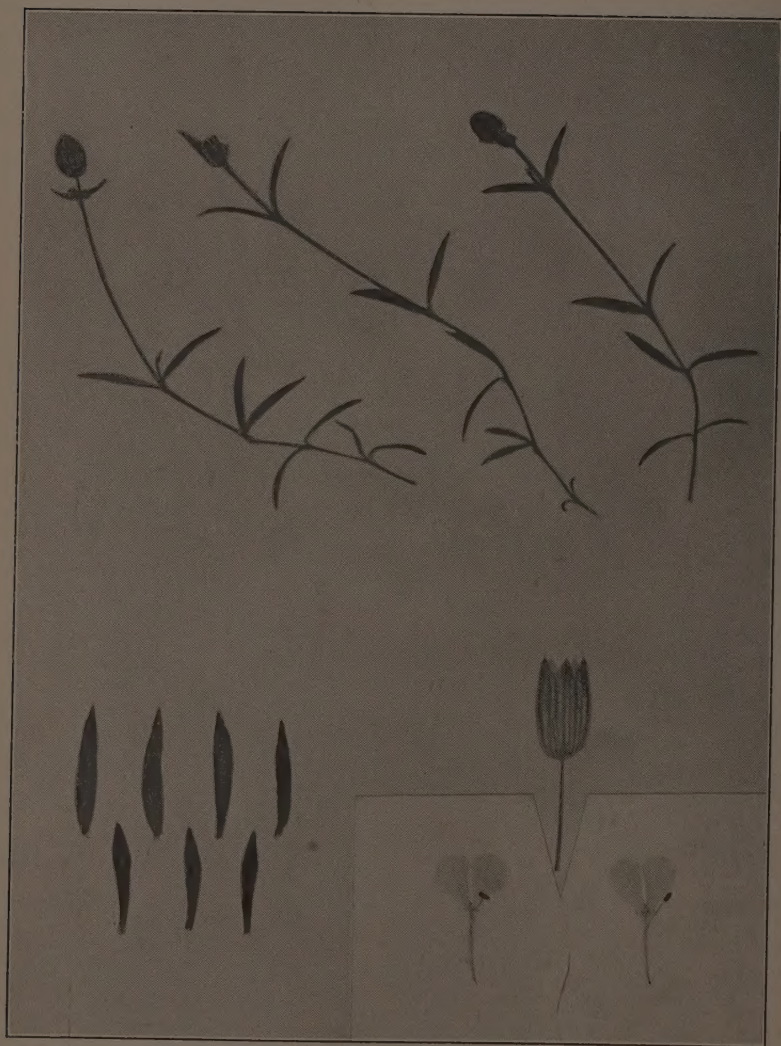
Habit prostrate, stems up to 2.5 dm. long ; a small amount of anthocyanin in all parts except the leaves.



Silene maritima, stock-plant A. 1, Tilly Whin, Swaniage, 1923.

[To face page 150.

PLATE VII



Silene maritima, stock-plant A. 15, Chesil Beach, Portland end, 1926.

To face page 151.]

Leaves ovate-lanceolate to lanceolate-ovate, acute, 1.8 cm. long, 5 mm. broad, margins with short well-spaced cilia, glaucous dark green.

Inflorescence as in A.3, 1-3 odd cilia on the bracts.

Calyx ellipsoid in flower and fruit.

Corolla with the petals and segments both contiguous; diameter 2.7 cm. Petals 2.4 cm. long, 1 cm. broad, lamina lobed for $\frac{3}{4}$ its length, scales well developed, no anthocyanin blotch above or below.

Androecium fully functional, flowers hermaphrodite.

Gynaeceum with purplish stigmata and pink immature seeds.

Ripe capsules obloid, without the teeth 6 mm. long, 7 mm. broad, mouth 4.5 mm. in diameter; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly reflexed; carpophore 3.5 mm. long, 2 mm. broad.

Mature seeds armadillo.

A.15. Chesil Beach, Dorset, Portland end, 1926.

Habit semi-prostrate, stems up to 2.5 dm. long; very much anthocyanin throughout the plant.

Leaves linear or narrowly lanceolate- or oblanceolate-linear, acute, slightly apiculate, slightly narrowed to the base, uppermost pair slightly amplexicaul, 2.2 cm. long, 3 mm. broad, very few widely scattered short cilia, somewhat fleshy, very dark glaucous green (the darkest of our stock-plants here described.)

Inflorescence as in A.3, bracts not ciliate.

Calyx narrow-cylindric in flower, obovoid-cylindric in fruit.

Corolla with the petals overlapping and the segments divergent; diameter 3 cm. Petals 2.7 cm. long, 1.5 cm. broad, lamina lobed for $\frac{3}{4}$ its length, scales well developed, anthocyanin blotch showing above and below.

Androecium fully functional, flowers hermaphrodite.

Gynaeceum with white stigmata and pink immature seeds.

Ripe capsules obloid, without the teeth 7 mm. long, 8 mm. broad, mouth 4.5 mm. in diameter; teeth each an isosceles triangle, 3.5 mm. long, 2 mm. broad at the base, strongly reflexed; carpophore 3.5 mm. long, 2.5 mm. broad.

Mature seeds armadillo.

A.16. Overcombe Beach, Weymouth, Dorset, 1926.

Habit semi-prostrate to suberect, stems up to 3 dm. long; a small amount of anthocyanin in calyx only.

Leaves linear to linear-lanceolate, acute, 2.3 cm. long, 4 mm. broad, short well spaced cilia on the margins, somewhat fleshy, green glaucous.

Inflorescence 3- to 7-flowered, bracts with few cilia at the apex.

Calyx broadly ellipsoid in flower, becoming broadly obovoid in fruit.

Corolla with the petals and segments contiguous or slightly overlapping; diameter 2.7 cm. Petals 2.4 cm. long, 1.5 cm. broad,

lamina lobed for $\frac{3}{4}$ its length, scales well developed, no anthocyanin blotch above or below.

Androecium fully functional, flowers hermaphrodite.

Gynaeceum with white stigmata and pink immature seeds.

Ripe capsules obloid, without the teeth 5 mm. long, 7 mm. broad, mouth 4.5 mm. in diameter; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly reflexed; carpophore 3.5 mm. long, 2.5 mm. broad.

Mature seeds armadillo.

A.17. Overcombe Beach, Weymouth, Dorset, 1926.

Habit semi-prostrate, stems up to 3.3 dm. long; much anthocyanin in the stem but not in the leaves.

Leaves linear to linear-lanceolate, acute, 1.8 cm. long, 4 mm. broad, with few scattered very short cilia, somewhat fleshy, dark glaucous green.

Inflorescence as in A.3, bracts not ciliate.

Calyx broadly ellipsoid in flower, becoming broadly obovoid in fruit.

Corolla with the petals and segments overlapping; diameter 2.8 cm. Petals 2.7 cm. long, 1.6 cm. broad, lamina lobed for $\frac{3}{4}$ its length, scales well developed, no anthocyanin blotch above or below.

Androecium fully developed, flowers hermaphrodite.

Gynaeceum with white stigmata and pink immature seeds.

Ripe capsules obloid, without the teeth 6.5 mm. long, 8.5 mm. broad, mouth 4 mm. in diameter; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly reflexed; carpophore 4 mm. long, 3 mm. broad.

Mature seeds armadillo.

A.18. Overcombe Beach, Weymouth, Dorset, 1926.

Habit semi-prostrate to suberect, stems up to 3.5 dm. long; much anthocyanin in stems but not in leaves.

Leaves linear to linear-lanceolate, acute, 2.1 cm. long, 4 mm. broad, with few scattered very short cilia, somewhat fleshy, green glaucous.

Inflorescence 3- to 7-flowered, bracts ciliate.

Calyx broadly ellipsoid narrowed above and below the middle, obovoid-ellipsoid in fruit.

Corolla with the petals and segments contiguous or slightly overlapping; diameter 2.6 cm. Petals 2.4 cm. long, 1.5 cm. broad, lamina divided $\frac{3}{4}$ its length, scales well developed, no anthocyanin blotch above or below.

Androecium fully developed, flowers hermaphrodite.

Gynaeceum with purplish stigmata and pink immature seeds.

Ripe capsules broadly ovoid, slightly contracted above, without the teeth 6.5 mm. long, 7.5 mm. broad, mouth 4 mm. in diameter; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly reflexed; carpophore 3 mm. long, 2 mm. broad.

Mature seeds armadillo.

A.19. Overcombe Beach, Weymouth, Dorset, 1926.

Habit semi-prostrate, stems up to 3 dm. long; much anthocyanin in stems but not in leaves.

Leaves linear to linear-lanceolate, acute, 2.4 cm. long, 4 mm. broad, cilia few and scattered, somewhat fleshy, green glaucous.

Inflorescence 3- to 7-flowered, bracts without cilia.

Calyx broadly ellipsoid narrowed above and below the middle, obovoid-ellipsoid in fruit.

Corolla petals and segments contiguous to slightly overlapping; diameter 2.4 cm. Petals 2.4 cm. long, 1.2 cm. broad, lamina divided $\frac{3}{4}$ its length, scales well developed, no anthocyanin blotch above or below.

Androecium fully developed, flowers hermaphrodite.

Gynaecium with white stigmata and pink immature seeds.

Ripe capsules obloid, without the teeth 6 mm. long, 7 mm. broad, mouth 4.5 mm. in diameter; teeth each an isosceles triangle, 3.5 mm. long, 2 mm. broad at the base, strongly reflexed; carpophore 3 mm. long, 2.5 mm. broad.

Mature seeds armadillo.

A.20. Porlock, Somerset, 1926.

Habit prostrate, stems up to 2.5 dm. long; whole plant yellowish green and without anthocyanin.

Leaves linear to narrowly linear-lanceolate, 1.7 cm. long, 3 mm. broad, with few scattered cilia, somewhat fleshy, yellowish green.

Inflorescence of 1 to 7 flowers, bracts glabrous.

Calyx ellipsoid in flower and fruit.

Corolla with the petals and segments scarcely contiguous; diameter 2.8 cm. Petals 2.4 cm. long, 1.2 cm. broad, lamina divided $\frac{3}{4}$ its length, scales not well developed, no anthocyanin blotch above or below.

Androecium functional or vestigial, in 1927 some flowers female some hermaphrodite.

Gynaecium with white stigmata and pink immature seeds.

Ripe capsules obloid, without the teeth 6 mm. long, 7 mm. broad, mouth 3.5 mm. in diameter; teeth each an isosceles triangle, 3 mm. long, 1.5 mm. broad, strongly reflexed; carpophore 4 mm. long, 1.5 mm. broad.

Mature seeds armadillo.

Plants grown from natural seed.

In order to obtain some definite data as to the amount of intra-specific hybridization and recombination of characters in nature, seed was collected from wild plants at the time they were transplanted as stock-plants in 1926. This seed was sown and the plants raised were analysed on August 6th, 1928, *i.e.* when the plants were in the middle of their second year's growth, with the following results.

FROM A.3. 6 plants raised. 3 in habit and leaves as seed-parent, 3 as stock-plant A.6. *Calyx* of 4 cylindric, of 2 broadly

ellipsoid. *Corolla* of 2 with petals and segments both contiguous, of 3 with petals and segments not overlapping or contiguous, of one with petals and segments both overlapping, all with anthocyanin blotch above and below. *Androecium* in all fully functional, flowers hermaphrodite. *Gynaeceum* 3 with white stigmata, one with purplish; all with immature seeds pink. *Mature seeds* of 4 armadillo, of 2 weak armadillo.

FROM A.4. 5 plants raised. 4 in habit and leaves as seed-parent, one somewhat paler. *Calyx* of 2 cylindric, of 2 broadly ellipsoid. *Corolla* of 3 with petals and segments not overlapping, of 2 (including that of the paler plant) with petals overlapping and segments not overlapping, 3 with anthocyanin blotch below only, 2 (including that of the paler plant) with anthocyanin blotch above and below. *Androecium* in all fully functional, flowers hermaphrodite. *Gynaeceum* 4 with white stigmata, one with purplish; all with pink immature seeds. *Mature seeds* of 4 armadillo, of one weak armadillo.

FROM A.6. 2 plants raised. One in habit and leaves as seed-parent, 1 as stock-plant A.3. *Calyx* of both broadly ellipsoid. *Corolla* of both with petals slightly overlapping and segments not overlapping, both with anthocyanin blotch above and below. *Androecium* in both fully functional, flowers hermaphrodite. *Gynaeceum* of both with purplish stigmata and pink immature seeds. *Mature seeds* of 1 armadillo, of the other tubercled.

FROM A.7. 15 plants raised. All in habit and leaves as seed-parent, except that 13 differed in colour of stems and of calyx. *Corolla* of none with divergent petals and segments, none with anthocyanin blotch. *Androecium* in all plants functional in some flowers, but 3 plants also with female flowers. *Gynaeceum* of all with white stigmata, 13 with pink immature seeds and 2 with white immature seeds. *Mature seeds* of all armadillo.

FROM A.10. 14 plants raised. All in habit and leaves as seed-parent. *Corolla* of none with divergent petals and segments, none with anthocyanin blotch. *Androecium* in all plants but one functional in all flowers, but one plant also with female flowers. *Gynaeceum* of 12 with white stigmata, of 2 with purplish stigmata, immature seeds of all pink. *Mature seeds* of all armadillo.

FROM A.12. 32 plants raised. All in habit and leaves as seed-parent, except that 23 differed in colour of stems and calyx. *Corolla* of none with divergent petals and segments, none with anthocyanin blotch. *Androecium* in all functional in some flowers, but 4 plants also with female flowers. *Gynaeceum* of 26 with white stigmata, of 6 with purplish stigmata, immature seeds of 9 white, of 23 pink. *Mature seeds* of all armadillo.

FROM A.14. 26 plants raised. All in habit and leaves as seed-parent. *Corolla* of 4 with petals not contiguous, of 22 with petals more or less contiguous, of none with anthocyanin blotch. *Androecium* in all functional in some flowers, but 4 plants also with

female flowers. *Gynaeceum* of all with purplish stigmata and pink immature seeds. *Mature seeds* of 24 armadillo, of 1 tubercled.

FROM A.15. 3 plants raised. All in habit and leaves as seed-parent. *Calyx* of all cylindric. *Corolla* in all with petals overlapping and segments contiguous, and with anthocyanin blotch above and below. *Androecium* in all fully functional, flowers hermaphrodite. *Gynaeceum* in all with white stigmata and pink immature seeds. *Capsules* of 2 obloid, of 1 broadly ovoid. *Mature seeds* of 1 armadillo, of 2 from weak armadillo to tubercled.

Note. In plants raised from A.7, A.10, A.12, and A.14 there was some degree of fluctuation in the breadth and colour of the foliage and in the diameter of the flowers.

While many of the differences indicated very probably arose originally as mutations, the stability of characters in generations resulting from controlled pollinations shows that it is most improbable that the differences from the seed-parents in the above samples arose immediately as mutations. These differences in samples of wild seed from one seed-parent indicate, in conjunction with all our other work, that there is a considerable amount of intra-specific crossing in nature. In this way various character-combinations can arise—by aggregation and by segregation of genes.

Variations in the characters of *S. maritima*.

It has become increasingly evident in the course of our work on *Silene maritima* and *S. vulgaris* that one of the lines of research most likely to throw light on the problems we are investigating is the study of characters one by one. Though analysis must here precede synthesis we do not at present commit ourselves to any conception of "unit characters" and, indeed, there are many characters we have not yet studied genetically, and none on which our researches are complete. Moreover, we wish to make it quite clear that for the moment we are not disputing that "the whole is not a mechanical aggregate indifferent to and without influence on its parts" (Smuts, *Holism and Evolution*, 218, London, 1927).

Roots. We have so far made only casual observations on the root-system of this species. The primary root-system of the seedling quickly penetrates the soil and branches tend to descend at a very acute angle. The mature main roots penetrate at least several feet in loose shingle. From the upper portions of the root-stock numerous buds arise. Root-stocks largely deprived of their main roots and with the aerial parts well cut back transplant easily and successfully. We have found no essential differences between the roots of *S. maritima* and *S. vulgaris* but hope to make further observations on the range of development of this organ in the two species. For a description of the root system in *S. vulgaris* as it grows on the English Chalk see the *Journal of Ecology*, xv. 109 (1927).

STEMS. The main stems are prostrate or procumbent. The ends and lateral shoots may be more or less ascending or erect.

When growing on cliff slopes the stems tend to become long trailing but when growing amongst other herbaceous or shrubby vegetation they become ascending, attenuated, and pseudo-erect; as we have observed, for example, near Abbotsbury and near Dawlish. The length of the stems, consequently the diameter of the plant, varies considerably with age and habitat. Important habitat factors are competition with plants of the same species and with general vegetation. We have so far no reason for postulating the existence of genetical factors modifying length of stem. Our measurements for length of single stems range from 1.8 dm. to 3.4 dm. A mature plant on the Chesil Beach had a diameter of 13 dm. The terete, solid or slightly hollow internodes at about the middle of mature stems average 2.3 cm. long and 1.5 mm. in diameter. The solid nodes average 2 mm. in diameter. Special attention should be called to the group of narrow-leaved plants found at the Portland end of the Chesil Beach. Their stems are decidedly more slender (diameter of internodes 1-1.5 mm., of nodes 1.5-2 mm.) and their internodes on an average longer (up to 5 cm. long) than is usual in wild populations. Although the stems are closely adpressed to the ground we have never found adventitious roots arising at the nodes either in nature or in cultivation. We have never seen puberulous or pubescent plants of *S. maritima*. The nodes, internodes, and leaves are always quite glabrous, except for a fluctuating amount of ciliation at the margins of the leaves and bracts. A considerable range occurs in the amount of anthocyanin present in the vegetative parts. Plants occur absolutely devoid of purple colouration, both in the vegetative and floral parts, while the other extreme is shown by plants whose green chlorophyll is masked by purple. Between these two extremes all grades occur. Both genetical and environmental factors are involved. The extremes have so far bred true in our experiments. On the other hand low temperatures increase for a time the amount of anthocyanin in families normally with a small amount.

The "barren shoots" in Silene maritima. It is generally stated that an important distinguishing feature between *S. vulgaris* and *S. maritima* is the absence of barren shoots in the former and their presence in the latter. Our extensive work of the past few years on a great range of living plants at all seasons of the year has made it evident that this statement needs further analysis. While it is true that the majority of individuals of *S. maritima*, at least throughout the growing season, show numerous non-flowering shoots in which flower buds cannot be distinguished, and the majority of individuals of *S. vulgaris* at the same stages of development have no shoots without flowers or flower-buds, the characters do not give an absolute distinction between the two species.

If the phrase "barren shoots" or "barren stems" is used it is important to remember that it merely signifies shoots without flowers, obvious flower-buds, or flower remnants at the time of

description. The phrase should not imply that the shoot is always barren, still less that it is constitutionally incapable of producing flowers. Indeed, we conclude from our observations and experiments that in both species all shoots are potential flower producers ; whether at a given time a shoot is or is not producing flowers depends on physiological and environmental factors, especially upon the phase of development of the individual plant and upon the season of the year.

The following are some of our recorded data on which these conclusions are reached :—

S. maritima.

1. Stock-plants of Transplants. Subsidiary plants at Kew. Collected and examined* 18.10.28.

The majority of the apparently barren shoots showed no trace of flowers or flower-buds. A few had buds at different stages of development.

2. Hurst Castle plants growing at Kew. Collected and examined 18.10.28.

The majority of the apparently barren shoots showed no traces of flowers or flower-buds. A few had buds at different stages of development.

3. Stock-plant 23, Dawlish. Growing at Potterne, collected 25.8.28.

All the apparently barren shoots examined had young flower buds.

4. Stock-plant 3, Chesil Beach. Growing at Potterne, collected 25.8.28.

Exactly half the apparently barren shoots had flower buds hidden among the young leaves, and exactly half had no distinguishable flower buds.

5. Mountain plant No. 21·2, from Brecknock Beacon. Growing at Potterne, collected 25.8.28.

None of the apparently barren shoots examined had flower buds.

6. Stock-plant 2, Swanage. Growing at Potterne, collected 25.8.28.

All the apparently barren shoots examined had flower buds hidden in the young leaf buds.

S. vulgaris.

In the height of the flowering season plants of this species have usually no barren shoots and often no shoots which even appear, without dissecting, to be barren (see *K.B.* 1928, p. 15). On the other hand, plants may develop shoots without flowers or flower-buds after the main flowering season is over.

The following examples will suffice to illustrate this statement.

K.533, grown from seed collected near Brunate, N. Italy, growing at Kew on 18.10.28, showed numerous short barren shoots arising from the lower parts of the stems, and examination failed to

*All examinations were made with the dissecting microscope to x 20 magnification.

reveal any traces of flower buds in these shoots. The same statement holds for K.454 grown at Kew from seeds collected above the Rila Monastery, Rodopes, Bulgaria, and for K.523 grown at Kew from seeds collected on the hills south of Varna, E. Bulgaria. More important still, the majority of the 25 subsidiary plants of the Transplant Experiments at Kew (Nos. 101-125) also showed barren shoots, due to secondary growth after flowering (18.10.28), without flowers or flower buds.

In general the flowering period of *S. maritima* is longer than the flowering period of *S. vulgaris*. The former flowers earlier in the spring and later in the autumn than the latter. The statement holds both for the majority of individual plants and for populations, though there are isolated exceptions. *S. maritima* has usually a much more spreading habit than *S. vulgaris*, due to the more prostrate stems and the greater production of lateral shoots. Some of these last elongate and branch to continue the main vegetative body, others quickly produce flowers, and still others form the "barren shoots" which may elongate or produce flowers as external conditions direct, or as food is available. Many buds and shoots even in *S. maritima* are also borne on the root-stock at varying depths. Indeed in the winter of 1927-28 at Potterne *S. maritima* behaved as a hemicryptophyte, while at Kew it was a combination of chamaephyte and hemicryptophyte. The same was true of *S. vulgaris* which, however, is much more of a hemicryptophyte than it is a die-back chamaephyte, especially in nature. Exactly the same was true for the winter 1928-29 till the severe frosts of February and March, when all the aerial parts were killed in both species at both localities, the plants surviving as pure hemicryptophytes.

Most of the *S. maritima* stock plants, *i.e.*, individuals transplanted from the wild, both at Kew and at Potterne, retain their full complement of shoots and leaves much longer than in *S. vulgaris*. A noteworthy exception is our stock plant 5 from the Portland end of the Chesil Beach. This is a narrow-leaved plant, with much anthocyanin in all its organs, whose aerial parts by the beginning of December, 1928, had completely died. Forty-five first-year plants grown from seeds obtained by controlled selfings of this individual and sown in the spring had also completely died down, or nearly so, by the same date.

LEAVES. General. Although the leaves on an individual plant show a large amount of fluctuation, the general leaf shape of a plant is a scorable character. Although we do not yet know the limits of plasticity of gene expressions or the degree of gene interaction for leaf shape and size, we know that genes are involved. In our measurements we give the size of average well developed leaves, unless we state to the contrary.

Shape. A central outline shape is lanceolate. In one direction variation is towards linear, in another towards ovate. In both directions the broadest portion may be shifted from below the middle

to above or to the middle. The most remarkable wild population we have so far met with is that growing at the Portland end of the Chesil Beach on the landward side. In these plants the leaf-shape is linear or some slight modification of linear. In all leaf shapes the apex is generally acute, but is sometimes slightly obtuse. There is a slight apiculus and sometimes the blade is "pinched in" just below the apex. The lower leaves are narrowed to the base, the upper are slightly amplexicaul.

Size. The length of average well developed leaves ranges in different plants from 1.2–2.7 cm., the breadth from 2 to 10 mm. We propose to term leaves less than 2 cm. in length "short," and those 2 cm. or more in length "long"; those less than 5 mm. in breadth are "narrow" and those 5 mm. or more "broad."

Margin. A narrow membranous margin surrounds the leaf. It often runs out into short distinct cilia, but this is a fluctuating character varying in different leaves on the same plant.

Texture. The leaf texture is constantly more succulent than in *S. vulgaris* relative to the superficial area of the leaf. We hope to treat this subject more fully after the results of the anatomical examination of our material are available.

Colour. The colour of the foliage shows a great range in wild populations. Anthocyanin content is dealt with under the heading of stems.

INFLORESCENCE. The flowers are erect and number from 1 to 7 on each inflorescence; there are usually not more than 3. We regard the few erect flowers as a specific character. The lower bracts are herbaceous, the upper scarious. On the whole the bracts are greener than in *S. vulgaris*. They may be quite glabrous or have marginal cilia.

CALYX. Both in the flowering and in the fruiting conditions there is a considerable range in calyx shape. The commonest type is the broadly ellipsoid. Contrasting with this is the narrow cylindric type. In the fruit the calyx naturally enlarges and there is a tendency for the broadest parts to be above the middle. In general we have been able to score calyces as broad or narrow—see figures in the text.

COROLLA. The variations in petal shape in this species have been studied by Dr. E. J. Salisbury.* We have seen in the wild all the types described by him, and are now growing specimens for genetical investigation. Here we only record observations and make tentative suggestions with regard to a number of characters.

Petal length. This ranges from 2.0 to 2.8 cm., and we propose to term petals measuring 2.4 cm. and below "short" and petals measuring 2.5 cm. and over "long."

Petal breadth. This ranges from 1.9 to 0.6 cm., and we propose to term petals measuring 1.4 cm. and over "broad," and those 1.3 cm. and below "narrow."

*New Phytologist, xi. 7 (1912).

Petal lobing. Normally the blade of each petal is bilobed for $\frac{3}{4}$ of its length and has two well-developed coronal scales at the base. We have occasionally seen plants with at least some petals with from 1 to 4 extra lateral lobes. Plants with this character are termed by Salisbury *forma lobata*, but we do not at present know the degree of stability of this character. Both the normal two lobes and the petals may be divergent, contiguous, or overlapping. For the present we consider the lobes and petals separately for these characters, whose factorial inheritance we have not yet studied.

Anthocyanin blotch. In several localities, especially on the Chesil Beach, we have found plants with a blotch of anthocyanin (colour, Ridgeway, Plate xi. "Rood's Violet") at the base of the blades of the petals. The blotch, which varies in size, is sometimes limited to the lower surface but often appears on the upper as well. Rarely, at the end of the flowering season the colour is diffused through the whole petal.

ANDROECIUM (sex). In the wild populations we have studied, the majority of the plants were hermaphrodite. Female plants, however, occur sporadically. Not infrequently hermaphrodite and female flowers may be found on the same individual. In our first paper we referred to the peculiar behaviour of stock-plant A.2, essentially a female, and we are continuing to keep it under observation.

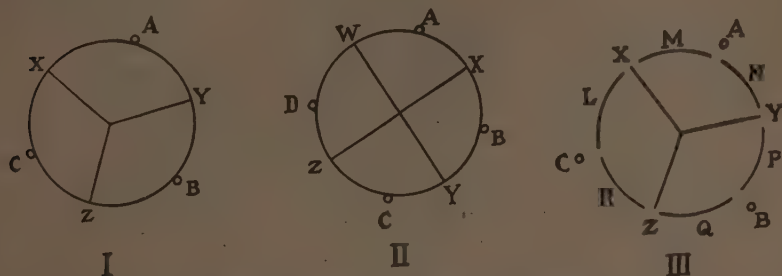
GYNAECEUM. Stigmata colour. Plants with purplish and others with colourless stigmata occur in the wild. At present we have nothing to add to the data of this character published in our first paper.

Colour of immature seeds. In *S. maritima* the majority of the plants have pink immature seeds. Plants with colourless immature seeds do, however, occur, and in one group examined on the Chesil Beach 25 plants had colourless immature seeds. Apart from this one group and two or three scattered individuals, all the many hundreds of *S. maritima* ovaries examined on the Chesil Beach had pink immature seeds. At Dawlish, S. Devon, only one plant was found with white immature seeds out of about 100 plants examined. At Porlock, Somerset, about another 100 plants were examined for this character and all had pink immature seeds.

FRUITS. For shape of capsule we have scored the items into two classes: broadly ovoid and obloid. The former are the more elongated and are slightly narrowed in the upper part. The latter are always broader than long, with large mouths relative to the size of the capsules, and are flattened, with a "squat" appearance. Text figures of the two types are given. Usually there is no difficulty in scoring, but occasionally we have obtained intermediates or a range in one individual plant (as in A.8).

The carpophore varies in length from 3 to 4.5 mm., and in breadth from 1.5 to 3 mm.

The normal capsule is composed of three syncarpous carpels each represented by one loculus dehiscing by two apical teeth. Flowers with gynaecea of 4 or 5 carpels occasionally occur, and these have 4 or 5 styles and yield carpels with 4 or 5 loculi and 8 or 10 teeth. Irregularities are occasionally found and in order to understand the range of these the following analyses were made. Since we felt it desirable to complete our studies of the gross morphological structure of the carpel the second set of data is fully recorded here.



Silene maritima. Diagrams of capsules.

I, Diagram of normal 3-locular capsule; II, Diagram of 4-locular capsule; III, Diagram of 3-locular capsule showing normal position of six teeth.

A.B.C.D. indicate position of the styles; W.X.Y.Z. indicate the position of septa; L.M.N.P.Q.R. indicate capsular teeth.

Flowers with more than three carpels.

I. Flowers on subsidiary plants of the Transplant experiments at Kew, *i.e.*, grown from seed, selfed under full control, of stock-plant 1. Each flower was tagged with a number indicating the number of styles. The mature capsules were examined on 27.9.28.

	Styles.	Teeth.	Loculi.
1	4	8	4
2	4	8	4
3	5	10	5
4	4	8	4
5	4	8	4
6	5	7	5

In capsule No. 6 there were 4 single and 3 double teeth. Each of the latter was opposite a septum.

II. Flowers marked at Potterne as having four or five styles each and then allowed to set seed naturally, that is they were not caged or bagged or artificially pollinated. The whole of this research was carried out in the latter part of the summer of 1928.

In the analytical account given below the identity number of the plant is given, the number of styles in each flower with more than 3, the number of capsules obtained and examined, the number of loculi in each capsule, and the number of teeth with the relative position of the septa and the cohesion of the teeth. A figure 1 indicates a

single capsular tooth, a bracket indicates fusion of teeth, those teeth within a pair of brackets not having separated, and a full stop indicates a septum.

maritima stock-plant 10. 1 capsule from a flower with 4 styles.
4 loculi. teeth II.I(I.I)(I.I)I.

maritima stock-plant 11. 4 capsules, each from a flower with 4 styles.

a. 4 loculi. teeth II.II.II.II.

b. 4 loculi. teeth II.II.(II).(II).*

c. 4 loculi. teeth II.II.II.II.

d. 4 loculi. teeth II.(II).II.(II).

maritima stock-plant 14. 1 capsule from a flower with 4 styles.
4 loculi. teeth II.II.I(I.I)I.

maritima stock-plant 17. 3 capsules, each from a flower with 4 styles.

a. 4 loculi. teeth II.II.II.(II).

b. 4 loculi. teeth II.II.II.II.

c. 4 loculi. teeth II.II.I(I.I)I.

maritima stock-plant 20. 1 capsule from a flower with 4 styles.
4 loculi. teeth I(I.I)(I.I)*(I.I)(I.

maritima stock-plant 21.2. 2 capsules, each from a flower with 4 styles.

a. 4 loculi. teeth II.II.I(I.I)I.

b. 4 loculi. teeth II.I(I.II)*.II.

N. 12 2 capsules, each from a flower with 4 styles.

a. 4 loculi. teeth II.II.(II)†.(II)†.

b. 4 loculi. teeth II.(II).(II).(II). This capsule was very young and the teeth would probably have split into 8 singles had the fruit been left on the plant to ripen.

N. 15. 10 capsules, each from a flower with 4 styles.

a. 4 loculi. teeth II.III.I(I.I)I. One extra tooth, due to injury of the ovary apex, probably from an insect puncture.

b. 4 loculi. teeth II.(II).II.II.

c. 4 loculi. teeth II.IIII.II.II. Two extra teeth in one loculus. There was no sign of injury and no sign of a fifth septum.

d. 4 loculi. teeth II.II.II.II.

e. 4 loculi. teeth II.II.II.II.

f. 4 loculi. teeth I(I.I)I.(II).II.

g. 4 loculi. teeth II.I(I.I)I.II.

h. 4 loculi. teeth II.II.II.II.

i. 4 loculi. teeth II.II.II.II.

j. 4 loculi. teeth II.II.II.II.

*Partly united.

†With style remnants at apices.

N.15. 1 capsule from a flower with 5 styles.
5 loculi. teeth II.(II).I(I.I)(I.II). This capsule was the largest seen and was full of good seeds.

N.16. 26 capsules each from a flower with 4 styles.

- a. 4 loculi. teeth II.II.II.II.
- b. 4 loculi. teeth I(I.I)(I.I)(I.I)(I.
- c. 4 loculi. teeth I(I.I)(I.I)I.II.
- d. 4 loculi. teeth II.(II).II.II.
- e. 4 loculi. teeth I(I.I)(I.I)I.II.
- f. 4 loculi. teeth II.(II)*.II.II.
- g. 4 loculi. teeth II.I(I.I)I.II.
- h. 4 loculi. teeth II.I(I.I)I.II.
- i. 4 loculi. teeth II.(II).(II).II.
- j. 4 loculi. teeth II.II.II.II.
- k. 4 loculi. teeth II.II.II.IO†.
- l. 4 loculi. teeth II.(II).II.II.
- m. 4 loculi. teeth I(I.I)I.I(I.I)I.
- n. 4 loculi. teeth II.II.II.II.
- o. 4 loculi. teeth II.I(I.I)I.(II).
- p. 4 loculi. teeth II.II.I(I.I)I.
- q. 4 loculi. teeth I(I.I)(I.I)I.II.
- r. 4 loculi. teeth I.(I.I)I.II.II.
- s. 4 loculi. teeth (II).(II).(II).(II). a poorly developed capsule.
- t. 4 loculi. teeth (II).(II).(II).(II).
- u. 4 loculi. teeth II.II.II.III. one extra tooth.
- v. 4 loculi. teeth II.II.II.II.
- w. 4 loculi. teeth (II).(II).(II).II.
- x. 3 loculi. teeth II.I(II)(I.I)II. one septum suppressed and represented only by a line down the wall of the ovary. One extra tooth present.
- y. 3 loculi. teeth II.III.III.
- z. 3 loculi. teeth II.II.II:I. one abnormal septum and one tooth perhaps double. The abnormal structure probably due to an early injury to the ovary.

N.16. 2 capsules each from a flower with 5 styles.

- a. 5 loculi. teeth (II.I)†(I.I)(I.I)(I.I)I.
- b. 5 loculi. teeth (II).(II.I)(I.I)I.(II).

N.21. 5 capsules each from a flower with 4 styles.

- a. 4 loculi. teeth II.II.II.II.
- b. 4 loculi. teeth II.II.II.II.
- c. 4 loculi. teeth II.I(I.I)I.II.
- d. 4 loculi. teeth II.I(I.I)(I.I)I.
- e. 4 loculi. teeth II.I(I.I)(I.I)I.

*Style remnant attached. †Destroyed by insect.

‡Style remains on this compound tooth.

N.22. 2 capsules each from a flower with 4 styles.

a. 5 loculi. teeth 1(1.1)(1.1)(1.1)1.

b. 4 loculi. teeth 11.1(1.1)(1.1)1.

N.25. 2 capsules each from a flower with 5 styles.

a. 5 loculi. teeth 11.1(1.1)(1.1)(1.1)1

b. 5 loculi. teeth 11.11.11.11.11.

A total of sixty-five capsules is recorded in the above analyses.

MATURE SEEDS. In our first paper we scored mature seeds into two classes on the basis of testa character—armadillo and tubercled. Further work has proved that this classification is not fine enough, and we now work with four classes—armadillo, weak armadillo, tubercled, and strongly tubercled. These are difficult to define in words but the figures indicate our standards.

Seed counts in wild populations have yielded the following results :—

				weak		strongly	
				armadillo.	armadillo.	tubercled.	tubercled
Chesil Beach, Portland end	...	62	3	5	—	—	—
Chesil Beach, general	...	26	—	—	—	—	—
Overcombe	31	—	—	—	—	—
Porlock	1	—	—	—	—	—
Hurst Castle	10	7	—	—	—	—
Pembroke	2	—	—	—	10	—
Dawlish (Lea Mount)	...	—	—	—	—	28	—
Dawlish (between the town and the Warren)	—	—	—	—	12	—
Teignmouth (Smugglers' Lane)	...	—	—	—	—	5	—
Shaldon	—	—	2	—	9	—
Paignton	3	—	—	—	—	—
Foula	—	—	1	—	—	—
Sark	—	—	—	—	2	—
Mainland, Orkney	1	—	—	—	—	—
Par Sands, Cornwall	1	—	1	—	—	—

In addition to the above, armadillo or weak armadillo seeds are known from Poole in Dorset, Eastbourne in Sussex, Heacham and Blakeney in Norfolk, from Iceland, from Sweden and from various localities in France. Tubercled to strongly tubercled seeds are at Kew from Aberdeen, Brean Down in Somerset, and various French localities.

Numbers of seeds per capsule.

With the double object of determining the numbers of seeds produced in single capsules and the proportion of good seeds to bad, a number of counts was made. The capsules were collected just before they opened and each record represents the seeds from one capsule.

Counts of seeds from single capsules.

Fr from stock-plant 1 selfed (strongly tubercled).

61 good 41 bad : 64 good 53 bad : 67 good 73 bad : 44 good
59 bad : 84 good 25 bad.

Range of total seeds from 140 to 102.

Highest number of good seeds 84.

Lowest number of good seeds 44.

Highest number of bad seeds 73.

Lowest number of bad seeds 25.

Average number of good seeds per capsule 64.

Average number of bad seeds per capsule 50.

Stock-plant 2.

22 good 99 bad : 30 good 65 bad : 35 good 111 bad : 35 good
96 bad : 36 good 86 bad : 38 good 80 bad.

Range of total seeds from 146 to 95.

Highest number of good seeds 38.

Lowest number of good seeds 22.

Highest number of bad seeds 111.

Lowest number of bad seeds 65.

Average number of good seeds per capsule 33.

Average number of bad seeds per capsule 89.

Stock-plant 3.

28 good 21 bad : 35 good 31 bad : 32 good 60 bad : 28 good
30 bad : 27 good 63 bad.

Range of total seeds from 92 to 49.

Highest number of good seeds 35.

Lowest number of good seeds 27.

Highest number of bad seeds 63.

Lowest number of bad seeds 21.

Average number of good seeds per capsule 30.

Average number of bad seeds per capsule 41.

Stock-plant 5.

30 good 28 bad : 21 good 37 bad : 35 good 22 bad : 25 good
35 bad : 27 good 25 bad : 34 good 28 bad.

Range of total seeds from 62 to 52.

Highest number of good seeds 35.

Lowest number of good seeds 21.

Highest number of bad seeds 37.

Lowest number of bad seeds 22.

Average number of good seeds per capsule 29.

Average number of bad seeds per capsule 29.

Stock-plant 6.

30 good 19 bad : 36 good 17 bad : 26 good 11 bad : 36 good
9 bad : 26 good 19 bad : 29 good 17 bad.

Range of total seeds from 53 to 37.

Highest number of good seeds 36.

Lowest number of good seeds 26.

Highest number of bad seeds 19.

Lowest number of bad seeds 9.
Average number of good seeds per capsule 30.
Average number of bad seeds per capsule 15.

Stock-plant 7.

58 good 16 bad : 93 good 11 bad : 84 good 18 bad : 68 good
21 bad : 124 good 13 bad : 111 good 17 bad.
Range of total seeds from 137 to 74.
Highest number of good seeds 124.
Lowest number of good seeds 58.
Highest number of bad seeds 21.
Lowest number of bad seeds 11.
Average number of good seeds per capsule 90.
Average number of bad seeds per capsule 16.

Stock-plant 13.

36 good 38 bad : 34 good 35 bad : 39 good 63 bad : 31 good
46 bad : 34 good 84 bad : 37 good 28 bad.
(The numbers for the first two and the last are not very
reliable as the capsules were too young to distinguish good from
bad seeds with certainty.)
Range of total seeds from 118 to 65.
Highest number of good seeds 39.
Lowest number of good seeds 31.
Highest number of bad seeds 84.
Lowest number of bad seeds 28.
Average number of good seeds per capsule 35.
Average number of bad seeds per capsule 49.

Stock-plant 17.

75 good 50 bad : 55 good 39 bad : 60 good 36 bad : 75 good
37 bad : 59 good 66 bad : 55 good 72 bad.
Range of total seeds from 127 to 94.
Highest number of good seeds 75.
Lowest number of good seeds 55.
Highest number of bad seeds 72.
Lowest number of bad seeds 36.
Average number of good seeds per capsule 63.
Average number of bad seeds per capsule 50.

Stock-plant 20.

29 good 58 bad : 37 good 44 bad : 40 good 29 bad : 38 good
56 bad : 42 good 34 bad : 31 good 37 bad.
Range of total seeds from 94 to 68.
Highest number of good seeds 42.
Lowest number of good seeds 29.
Highest number of bad seeds 58.
Lowest number of bad seeds 29.
Average number of good seeds per capsule 36.
Average number of bad seeds per capsule 43.

Stock-plant 23 (strongly tubercled).

110 good 23 bad : 101 good 20 bad : 68 good 54 bad : 114 good

23 bad : 89 good 18 bad : 138 good 44 bad.

Range of total seeds from 182 to 107.

Highest number of good seeds 138.

Lowest number of good seeds 68.

Highest number of bad seeds 54.

Lowest number of bad seeds 18.

Average number of good seeds per capsule 103.

Average number of bad seeds per capsule 30.

For the whole of the collections examined :

Number of capsules 58 from 10 plants.

Range of total seeds from 182 to 37.

Highest number of good seeds 138.

Lowest number of good seeds 21.

Highest number of bad seeds 84.

Lowest number of bad seeds 9.

Average number of good seeds per capsule 51.

Average number of bad seeds per capsule 41.

Note : High numbers in plants, 7, 17, 23.

Low numbers in plants, 3, 5, 6, 20.

High numbers of bad seeds in plant 2.

There is some evidence that the numbers of good and bad seeds per capsule is an inherent character of the individual plant. The evidence is not entirely satisfactory and by itself cannot lead to any further conclusions.

The "bad" seeds examined under the compound microscope showed varying degrees of development. In all those examined it was possible to distinguish the markings on the light brown testa. By far the greater number were translucent and obviously devoid of embryo and endosperm. It appears that all the ovules make some attempt to develop into seeds and that the partial formation of a testa is carried out even if the seeds do not mature.

The recognition of the large number of ovules which do not produce viable seeds as indicated by these studies is of considerable importance, since any kind of selective fertilization, or the presence of lethal or sublethal factors, would probably prevent expected ratios being obtained in controlled crosses. Tests of germination capacity of "good" seeds are now in progress.

Tests and recounts indicated that the figures given are for the "good" seeds accurate to about 2 per cent., for the "bad" seeds to about 5 per cent. Causes of error are the shooting away of seeds as the capsules are opened, breaking of "bad" seeds (which are often flat thin plates), covering of "bad" seeds when they adhere to "good" ones or to one another, and the difficulties of distinguishing between "good" and "bad" seeds. The last cause of error is most important when the capsule was gathered before the seeds were quite mature.

Intra-specific variation.

In this paper we are only incidentally concerned with inter-specific differences. So far as lowland plants in this country are concerned there is no practical difficulty in maintaining *S. maritima* and *S. vulgaris* as distinct species, although in a future paper we shall indicate how all their morphological characters overlap. Moreover, there is a remarkable degree of parallelism between the intra-specific variation of the two species.

We have already indicated a considerable number of variable characters within *S. maritima*. These characters appear in numerous combinations. Indeed, at present we know of no limits to the possible combinations of characters. It would be a useless and confusing result were we to give names to all the character combinations we have found. The same problem, in an even more intense form, has arisen in *S. vulgaris* and has, indeed, been recognized in that species. At least two methods of intra-specific nomenclature have been proposed. Ascherson and Graebner [*Synopsis der Mitteleur. Flora* v. 2. 64 (1920)] have various subordinate ranks to which Latin trivial names are given. The subordination has been based entirely on morphological conceptions, derived mainly from dried material, and is therefore largely subjective. The system also constantly breaks down when applied to wild populations and is not sufficiently elastic to be improved without basic alteration. Negodi [*Archivo Botanico* iv. 40, 138, 217 (1928)], on the other hand, recognises the weakness of Ascherson and Graebner's method, but also allows himself to fall under the tyranny of names. He subordinates *S. maritima* and *S. vulgaris* to the rank of subspecies of one species which he terms *S. angustifolia*. Under each subspecies he then makes a large number of varieties. Even with the unwieldy number of varietal names he uses (up to the last published part, March 1929, these number 56), many character combinations already known to us are not accounted for. The character combinations ignored are taxonomically and genetically the equivalents of those to which names have been given.

Knowing that some of our botanical colleagues are finding similar difficulties in other groups of plants, we feel it is desirable to put forward tentative proposals for a new method of dealing with intra-specific variation within a polymorphic Linneon. The scheme we use here must not be in any way accepted as final. Until our genetical researches have indicated the value of all the characters found in both species it is bound to remain incomplete. Our ideal is to formulate a scheme comparable with chemical symbolism.

Scheme.

Let R=roots, S=stems, L=Leaves, I=inflorescence, K=calyx, C=corolla, A=androecium, G=gynaeceum, F=fruits, Se=seeds.

Up to the stage at which our work has arrived we need the following figure symbols for intra-specific variation in *S. maritima*.

- L.1=leaves long, *i.e.*, 2 cm. or more than 2 cm. in length.
 2=leaves short, *i.e.*, less than 2 cm. in length.
 3=leaves broad, *i.e.*, 5 mm. or more than 5 mm. in breadth.
 4=leaves narrow, *i.e.*, less than 5 mm. in breadth.
 5=leaves with much anthocyanin.
 6=leaves with no anthocyanin.

- K.1=calyx broad in flower.
 2=calyx narrow in flower.

- C.1=petals long, *i.e.*, 2.5 cm. or more in length.
 2=petals short, *i.e.*, less than 2.5 cm. in length.
 3=petals broad, *i.e.*, 1.4 cm. or more in breadth.
 4=petals narrow, *i.e.*, less than 1.4 cm. in breadth.
 5=petals bilobed.
 6=petals multilobed.
 7=petals overlapping or contiguous.
 8=petals not overlapping or contiguous.
 9=petal lobes overlapping or contiguous.
 10=petal lobes not overlapping or contiguous.
 11=anthocyanin blotch present.
 12=anthocyanin blotch absent.

- A.1=functional stamens present (flowers hermaphrodite).
 2=functional stamens absent (flowers female).

- G.1=stigmata purplish.
 2=stigmata colourless (white).
 3=immature seeds pink.
 4=immature seeds colourless (white).

- F.1=capsules broadly ovoid.
 2=capsules obloid.

- Se.1=mature seeds armadillo.
 2=mature seeds weak armadillo.
 3=mature seeds tubercled.
 4=mature seeds strongly tubercled.

Although in the table we have not had occasion to do so, it is possible to utilize the same scheme for fluctuating characters. Thus if one has a plant in which the calyx is intermediate between broad and narrow, the shape can be represented by K.1-2 if it is exactly intermediate or verges towards the narrow standard, or by K.2-1 if it verges more towards the broad standard. If measurements are involved in the definitions of the primary figure symbols any degree of precision in recording intermediates can be obtained by the use of the decimal system.

To further illustrate the use of symbols the formulae for a number of the stock plants already described are given.

A.3.	L.1.4.5.	K.1.	C.1.3.5.7.9.11.	A.1.	G.2.3.	F.1.	Se.2.
A.4.	L.1.4.5.	K.1.	C.1.4.5.8.10.11.	A.1.	G.2.3.	F.1.	Se.1.
A.5.	L.1.4.5.	K.2.	C.1.4.5.8.9.11.	A.1.	G.1.3.	F.1.	Se.1.
A.7.	L.2.4.6.	K.1.	C.1.3.5.7.9.12.	A.1.	G.2.4.	F.2.	Se.1.
A.9.	L.1.4.5.	K.2.	C.1.4.5.7.9.11.	A.1.	G.2.3.	F.1.	Se.3.
A.14.	L.2.3.6.	K.1.	C.2.4.5.7.9.12.	A.1.	G.1.3.	F.2.	Se.1.

Identity No.	Locality.	L.1. 2. 3. 4. 5. 6.	K.1 2.	C.1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	A.1. 2.	G.1. 2. 3. 4.	F.1. 2.	Se.1. 2. 3. 4.
1	Chesil Beach, Portland end	1. 4. 5.	2.	2. 4. 5. 8. 10. 11.	1.	2. 3.	2.	1.
2		2. 4. 5.	2.	2. 4. 5. 7. 10. 11.	1.	2. 3.	2.	1.
3		1. 4. 5.	--	-- -- 6. 7. 10. 11.	1.	1. 3.	--	1.
4	"	1. 4. 5.	2.	2. 4. 5. 7. 10. 11.	1.	1. 3.	2.	1.
5	"	2. 4. 5.	2.	2. 4. 5. 7. 9. 11.	1.	1. 3.	2.	3.
6	"	2. 4. 5.	2.	2. 4. 5. 7. 10. 11.	1.	2. 3.	2.	1.
7	"	2. 4. 6.	2.	2. 4. 5. 8. 10. 11.	1.	2. 4.	1.	1.
8	"	2. 4. 5.	2.	2. 4. 5. 8. 10. 11.	1.	2. 3.	2.	3.
9	"	2. 4. 5.	2.	2. 4. 5. 7. 9. 12.	1.	2. 3.	2.	1.
24	"	2. -- 5.	1.	-- -- 5. 7. 10. 11.	1.	2. 3.	--	3.
10	Chesil Beach, opposite Wyke Regis	2. 4. 6.	2.	2. 4. 5. 7. 10. 12.	1.	2. 4.	--	--
11	Chesil Beach, Abbotsbury	1. 3. 6.	1.	2. 3. 5. 7. 9. 12.	1.	2. 3.	1.	1.
12		1. 3. 6.	1.	2. 4. 5. 8. 9. 12.	1.	2. 3.	2.	1.
13		2. 3. 6.	1.	2. 4. 5. 7. 9. 12.	1.	2. 3.	1.	1.
14		2. 3. 6.	1.	1. 4. 6. 8. 10. 12.	1.	2. 3.		1.
15		2. 3. 6.	1.	2. 4. 6. 7. 9. 12.	1.	2. 3.	--	--
16		-- -- 6.	1.	-- -- 6. 7. 9. 12.	1.	1. 3.	--	1.
17		2. 4. 6.	1.	2. 4. 5. 8. 10. 12.	1.	2. 3.	2.	1.
19		2. 4. 6.	1.	2. 4. 6. 7. 9. 12.	1.	2. 3.	2.	1.
20		2. 4. 6.	1.	1. 4. 6. 7. 9. 12.	1.	2. 3.	2.	1.
21		2. 4. 6.	2.	2. 4. 5. 7. 9. 12.	1.	2. 3.	--	1.

In the table when, for one reason or another, a character has not been scored a dash takes the place of a figure symbol.

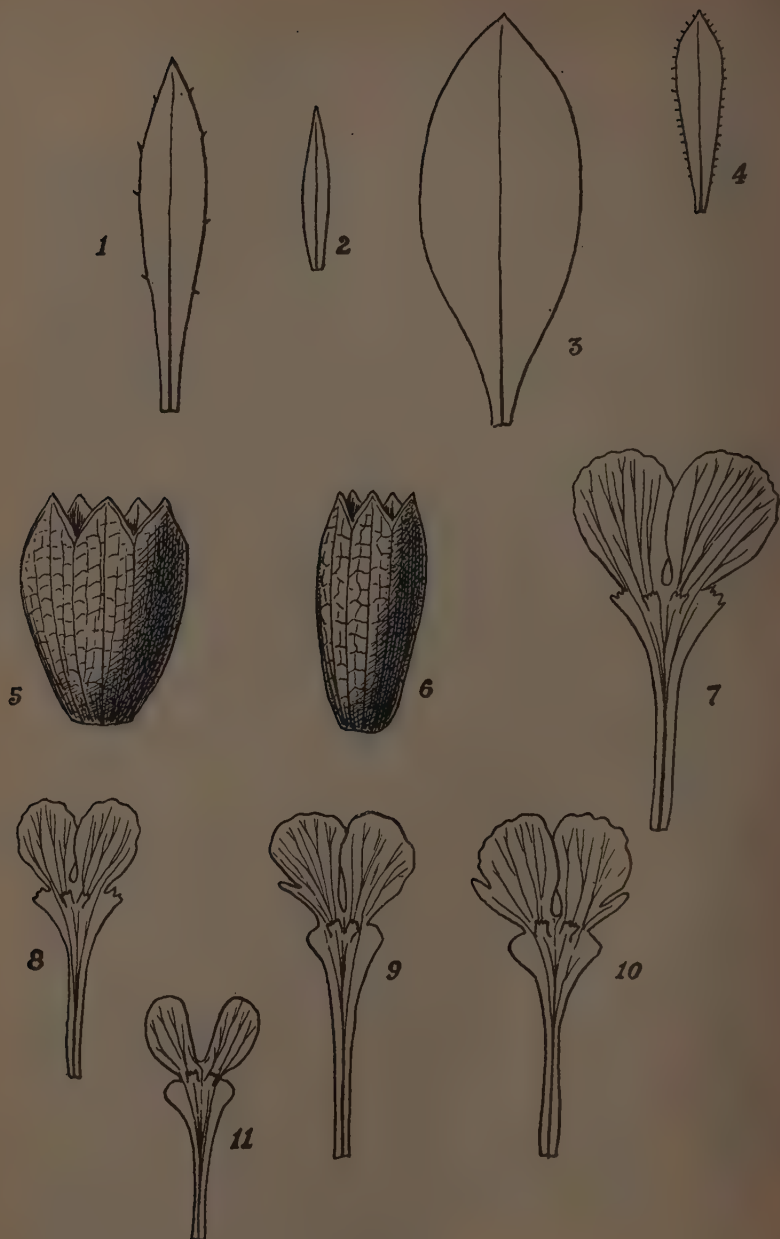
Studies on wild populations.

CHESIL BEACH, DORSET.

S. maritima occurs discontinuously on the landward slopes along the whole beach. Towards the Portland end there is a remarkable isolated group of 1310 individuals (19.7.28) with slender habit, narrow leaves, and usually much anthocyanin. Although not uniform in all characters, as indicated by the table (Nos. 1 to 9 and 24), the plants obviously form a group distinct from the rest of the population. From the next mass of *Silenes* on the shingle this group is separated by a distance of about 800 yards and is divided into 6 unequally sized smaller patches. The total length of the group is about 300 yards and its greatest breadth, at right angles to the beach, 31 yards, reaching to within 6 yards of the edge of the shingle. Where these narrow-leaved plants occur the pebbles are whitish as contrasted with the pale yellow brown of the rest. On them the following lichens were common. *Buellia confervoides*, *B. myriocarpa* and *Rhizocarpon confervoides* (determined R. Paulson, 4.2.29). Associated with the *Silenes* in a very open community were *Geranium robertianum* and *Rosa spinosissima*. A more or less continuous narrow zone of stouter, broader-leaved, greener *Silenes* was growing along the stabilized edge of the shingle. Although the group at the Portland end could easily be cross-pollinated by insect visitors from these *Silenes* at the shingle edge or even from the group 800 yards away, we could find no trace in the group of such cross-pollination having occurred. Further, natural seed collected from these plants and sown at Potterne also gave no evidence of cross-pollination having occurred with plants outside the group.

Nearly opposite Wyke Regis another mass of plants was examined. These formed a marked contrast to the community at the Portland end of the Beach. They were growing on more stabilized shingle. All types were present except those with slender stems, very narrow leaves (relative to breadth), and much anthocyanin. Individuals with shorter and greener leaves were dominant. Plants with an anthocyanin blotch on the petals occurred but were not so numerous as at the Portland end; more than 50 per cent. of the plants examined were without it. In an area 24 yards by 8, fourteen plants with no anthocyanin in any of their parts were counted growing amongst plants with little to a medium amount of anthocyanin. They all had white immature seeds. Scattered about outside the above area 11 more were found with no anthocyanin and immature seeds white. Plants attacked by *Ustilago* were here rather prevalent.

At the Abbotsbury end of the Chesil Beach the *Silene* population was studied over about 3 miles of shingle. A small proportion of narrow leaved plants was seen. Taking the population as a whole



the plants had usually only a small amount of anthocyanin. *Ustilago* was very prevalent and traces of *Marssonina* were also seen. The *Silene* plants sometimes formed an almost closed community stabilizing the shingle. The greatest width of shingle with *Silene* plants was 80 yards, measured at right angles to the shore. Plants without an anthocyanin blotch on the petals were more frequent than those with one, and it was noticed that the plants attacked by *Ustilago* tended to develop the blotches. Some plants of *Silene* were growing amongst the bushes of *Tamarix* near the edge of the shingle and had considerably elongated their stems and increased the size of their leaves.

OVERCOMBE BEACH, EAST OF WEYMOUTH, DORSET.

For about half-a-mile on loose shingle *Silene* plants form a scattered very open type of vegetation. The population as a whole agrees very closely with that occurring on the Chesil Beach opposite Wyke Regis. The plants are all green, without anthocyanin, or with only a small amount, and a few were noted with reddish anthocyanin in the calyx. There were fewer with blotches on the petals than without.

DAWLISH, S. DEVON.

In our second paper on *Silene* we have described the occurrence of hybrids in this district and have given a general account of their distribution and of that of their parents. It will suffice to add that between Dawlish and Dawlish Warren *S. maritima* grows on the cliff and down to the railway line. A path runs along the top of the cliff and is bounded on the cliff side by rails, which are 7 yards from the edge, and on the inland side by a hedge, composed of *Ulex*, *Prunus*, *Rubus*, and *Eupteris*, 4 yards in width. 5 plants were found on the inland side of the hedge growing up into it. They had much attenuated stems and large leaves. Other plants grew on the seaward side of the hedge and amongst gorse and bracken between the rails and the cliff.

EXPLANATION OF FIGURES ON PAGE 172.

Silene maritima. Fig. 1, Leaf of plant number 1 from Chesil Beach, Portland end (stock-plant 26), long and narrow, $\times 2$. Fig. 2, Leaf of plant number 8 from Chesil Beach, Portland end, short and narrow, $\times 2$. Fig. 3, Leaf of plant number 12 from Chesil Beach, Abbotsbury end, long and broad, $\times 2$. Fig. 4, Leaf of plant from Kimmeridge, short and narrow, margins strongly ciliolated, $\times 2$. Fig. 5, Calyx from plant number 20 from Chesil Beach, Abbotsbury end, broad in flower, $\times 2$. Fig. 6, Calyx from plant number 21 from Chesil beach, Abbotsbury end, narrow in flower, $\times 2$. Fig. 7, Petal from stock-plant A. 12, as grown at Potterne, long and broad, bilobed, lobes overlapping, $\times 2$. Fig. 8, Petal from plant number 9 from Chesil Beach, Portland end, short and narrow, bilobed, lobes contiguous to overlapping. Fig. 9 and Fig. 10, Petals from same flower of plant number 20, Chesil Beach, Abbotsbury end, multilobed, $\times 2$. Fig. 11, Petal from plant on Chesil Beach, Abbotsbury end, to show divergent lobes, giving a stellate appearance to the flower, $\times 2$.

SMUGGLER'S LANE, TEIGNMOUTH.

One plant of *S. maritima* was found growing on a stone wall 40 yards from the coast.



12



13



14



15



16



17

Silene maritima. Fig. 12, Capsule of ovoid type, $\times 2$. Fig. 13, Capsule of obloid type, $\times 2$. Fig. 14, Seed of armadillo type, $\times 12$. Fig. 15, Seed of weak armadillo type, $\times 12$. Fig. 16, Seed of tubercled type, $\times 12$. Fig. 17, Seed of strongly tubercled type, $\times 12$.

Summary and Conclusions.

1. Descriptions are given of stock-plants, of *Silene maritima*, which have been used up to 1928 for breeding experiments. These descriptions alone indicate that a great range of characters and character-combinations occurs in nature.

2. An account is given of plants grown from samples of wild seed. It is shown that intra-specific crossing largely accounts for the numerous different character-combinations found in individuals of wild populations.

3. The characters which have been found in the species as a whole, excluding mountain plants, are considered under the following headings: roots, stems (barren shoots), leaves (general, shape, size, margin, texture, colour), inflorescence, calyx, corolla (petal length, petal breadth, petal lobing, anthocyanin blotch), androecium (sex), gynaecium (stigmata colour, colour of immature seeds), fruits (extra carpels), mature seeds (number of seeds per capsule).

4. It is shown that there are many different characters exhibited by the different organs within the one species. Moreover these occur in numerous combinations—indeed at present we have no reason for supposing that any theoretically possible combination does not occur in nature. It would appear that whatever linkage groups exist are at times broken by crossing over.

5. The uselessness and inconvenience of attempting to name all the character-combinations (known or possible) as subspecies,

varieties, forms, etc., is commented upon. For many of the characters it is impossible to assign valid reasons for accepting one or several as having superior taxonomic value over others. For these reasons, amongst others, a tentative scheme is proposed for dealing with intra-specific variation within a polymorphic Linneon. The scheme involves the use of letters and arabic numerals and it is intended to extend its use in future papers in this series.

6. A summary account is given of the distribution of wild populations on the Chesil Beach and Overcombe Beach, in Dorset, and at Dawlish, S. Devon. Attention is called to a remarkable group of 1310 plants at the Portland end of the Chesil Beach. These form the most uniform wild population yet studied and, with few exceptions, agree in having a lax general appearance, narrow leaves, and much anthocyanin.

XXVIII.—MISCELLANEOUS NOTES.

The Minister of Agriculture and Fisheries has appointed Mr. LEWIS STENNING to be Assistant Curator of the Royal Botanic Gardens, Kew, in succession to Mr. Taylor.

DR. VIKTOR FERDINAND BROTHERUS, who died at Helsingfors in February, 1929, in his 90th year, had long been a correspondent of Kew and had rendered valuable assistance in naming mosses. He will be best remembered for his work on the mosses in Engler & Prantl's *Pflanzenfamilien*, 1901-1909, the second edition of which appeared in 1924-25. His first paper, entitled "Nagra exkursionen omkring Ponoj" was published in 1873 in the *Botaniska Notiser*, and his last early in 1929, called "Symbolae Sinicae," dealt with the mosses collected in China by Prof. H. Handel-Mazzetti. During this interval of 56 years he issued papers on the mosses of nearly all parts of the world, and was justly regarded as the leading bryologist.

In 1872 Brotherus collected mosses in Lapland, and in 1877 and again in 1881 he visited the Caucasian Alps and distributed named sets of the mosses he collected there. He made a journey to Central Asia in 1896. His moss herbarium is said to contain 110,000 specimens.

His interest was not entirely confined to mosses, for annually from 1909 to 1917 he published a record of the opening of flowers and unfolding of leaves of plants at various stations in Finland. He was elected a Foreign Member of the Linnean Society in 1920.

C. H. W.

JOHN WILLIAM HARSHBERGER.—We regret to record the death of Professor J. W. Harshberger on the 28th of April last. For the greater part of his life he was associated with the University of Pennsylvania and had held the Chair of Botany since 1911. He visited Europe in 1923 and called at Kew on his homeward journey.

The Lilac.—There is no shrub, introduced or native, that is more characteristic of our villages and country gardens than the common lilac, and the love English people have for it has led them to associate

it with a particular season of the year, now generally known as "Lilac time." It would seem by the publication of this work* that it enjoys, or is likely to enjoy, a similar popularity in America, for no genus of ornamental shrubs, other perhaps than *Rosa* and *Rhododendron*, has had devoted to it so sumptuous a volume as this on *Syringa*.

Mrs. McKelvey's work is a handsome quarto volume running to six hundred pages of letterpress and is illustrated by 171 full page plates, most of them reproductions of photographs made in the Arnold Arboretum.

It is remarkably thorough and comprehensive from historical, botanical and horticultural points of view. Mrs. McKelvey has evidently culled from every available source all the information of any interest that bears on her subject, and this, added to her own work and research, has enabled her to produce a book of great interest and distinction.

The genus *Syringa* is a well-marked one. Of cultivated plants, *Forsythia* is most nearly related to it, but this is, of course, distinguished by its yellow flowers. Mr. Alfred Rehder has furnished a key to the genus. The twenty-eight species admitted into it are conveniently and naturally grouped into two sections, viz., *Eusyringa* and *Ligustrina*, and of the former of these he makes two series, the *Villosae* and *Vulgares*. The section *Ligustrina* has a superficial resemblance to some of the privets (*Ligustrum*), but the latter are well marked by their juicy, berry-like drupes, the fruit of *Syringa* being always a dry loculicidal capsule. The genus as a whole presents no particularly embarrassing botanical problems, although authors have created some by making too many species. There has been on this account considerable confusion amongst the lilacs introduced during the present century from China, as has happened also in other genera recruited in recent times from the same country. Several plants given specific rank in as recent a publication as the *Plantae Wilsonianae* are here reduced. Amongst names that Mrs. McKelvey sinks as synonyms are *S. Sargentiana* (under *Komarowii*); *S. Wilsonii*, *S. Rehderiana*, *S. albo-rosea* and *S. Adamiana* (under *tomentella*); *S. Palabianiana* and *S. Koehneana* (under *velutina*). We are thereby saved much trouble going from bush to bush trying to find distinctions that do not exist.

Mr. E. H. Wilson contributes a very interesting chapter on the history and distribution of the genus, and Mrs. McKelvey has obtained help on cultural matters and on diseases and pests. But the great bulk of the work is her own, and it stands as a monument to her wonderful industry. The references she has compiled from works in every civilised language must have involved enormous labour; those concerning *S. vulgaris* alone fill more than two pages.

W. J. B.

*The Lilac. A Monograph, by Susan Delano McKelvey. 1 vol. quarto. The Macmillan Company, New York, 1928. Pp. xvi + 581, plates 171. Price £3 15s. nett.